Infrastructure, Collaboration, and Strategic Approach

Akira Tachi
National Institution for Academic Degrees

1. Possibilities and a crisis

The advances of information technology bring some novel possibilities and a new crisis in higher education. The practical use of multimedia or information technology has a potential to improve the quality of higher education and access to it by leaps and bounds. Classroom sessions are genuinely reinforced or enriched by high-technology equipment and systems such as the Internet. Construction of a lifelong learning society where anyone can benefit from higher education may become an actual reality through the use of technologies like videoconference-based distance learning. Information technology is going to offer a tool for the solution of present efforts to improve the quality of higher education and access to it with the limited financial resources available.

On the other hand, a crisis hides behind this: the higher education institutions with faulty and obsolete technologies and equipment will fall behind. As long as the information technology is high in quality and accessibility, the institutions equipped with high technology will expel the institutions which cannot get it. If existing institutions do not offer this, non-traditional suppliers from outside the higher education sector will emerge and offer this (Massy and Zemsky, 1995), and international supply routes will emerge when domestic suppliers cannot realize this. In the section on "the development of computer-based learning materials" in the Dearing Report, a UK policy paper on higher education released in June 1997, the author points out that "It is clear that competition in the provision of materials is coming from institutions overseas and from private companies. An American company plans a UK launch of educational provision using television. The Harvard Business School could easily make its Master in Business Administration programme available through the Internet, although as yet it has no plans to do so. The Massachusetts Institute of Technology is developing basic learning materials in physics, mathematics and engineering, which might eventually find a world market." The paper calls for the reinforcement of UK competitive power (National Committee, 1997).

Accordingly the effective equipment of information technology is one of the most important subjects that higher education of the present age faces. Notwithstanding, information technology has some natural limits and will never wholly replace face-to-face education. Moreover many technological, economical, and organizational obstacles await on the path toward the realization

of the possibilities of information technologies. To realize the potential, we need more concern about infrastructure, collaboration, and a strategic approach.

2. Information technology and transfiguration of higher education

The application of information technology to higher education has two types of effects: improvement of quality and expansion of opportunities. Roughly classifying, there have been two forms of teaching in higher education, just as before. One is a form of face-to-face classroom session, and the other is a form of distance learning. A face-to-face classroom is a traditional educational form where a teacher and a grope of students meet directly in a classroom. Distance learning, on the other hand, is a rather new form of education where a teacher and a student do not meet directly, and learning occurs through printed teaching materials delivered by the public postal service and/or broadcasting systems. The practical use of information technology changes both of these forms.

When high information technology is equipped in face-to-face classroom sessions, it is expected to improve the quality of classroom teaching-learning works through expansion of access to materials, effective presentations, class exchanges with other institutions (including foreign ones), close advising by e-mail, etc. In other words, traditional face-to-face classrooms evolve into "IT-equipped face-to-face classrooms."

On the other hand, when information technology is introduced into the distance learning form, it offers higher interactivities than previous media and contributes to epoch-making improvement of quality. Thus, it becomes "IT-mediated distance learning." Accordingly the education transmitted by this information technology is designed to attract some strata of students that have not gleaned sufficient learning in the traditional distance system or have missed out on its charm in higher education.

In addition, there are some results which suggest that the educational effect of IT-mediated distance learning is higher than the effect of a face-to-face classroom with many students and low interactivity. Thus, IT-mediated distance learning can share a class of excellent teachers and has the potential to replace some part of face-to-face classrooms.

Some IT-equipped face-to-face classrooms also educate students in remote areas, adopting the role of distance education. In other words, the border between IT-equipped face-to-face classrooms and IT-mediated distance learning is narrowing. "Rethinking the Role of the Professor in an Age of High-Tech Tools," an article from The Chronicle of Higher Education, shows a model of university teaching in the future (Young, 1997a).

□Course design

Courses could be designed and produced by teams of technology expert and professors, and then marketed by publishers or brand name universities.

□Lectures

Lectures could be replaced by multimedia CD-ROMs or World-Wide Web sites that include video recordings of talks by world-renowned scholars.

□Discussions

Relieved of some of their responsibilities, professors could lead more focused discussions in face-to-face or on-line sessions, and could help students navigate on-line resources.

□Assessment

Grading could be handled by an independent assessment organization, reassuring employers that evaluations were impartial and not subject to grade inflation.

3. **Limitations of information technology and problems on practical use**

Information technology is viewed as a way to overcome many of the defects of traditional education, but even if IT-mediated education works effectively, it cannot substitute all of the functions of traditional classroom sessions or traditional colleges and universities.

Though information technology is called multimedia, it is effectively only applied to the human senses of sight and hearing. Even now, it is poor in the bodily sense of smell, touch, and taste. Besides, in a traditional classroom, the formation of knowledge and development of skill take place through silent interaction. An important function of colleges is the socialization of students-young people who are looking for friends and spouses and want to enjoy cultural events. In traditional colleges and universities, direct face-to-face meetings are conducted for their own sake. Accordingly, the ranges of availability of information technology to higher education depend on the purposes of participants and institutions.

Furthermore various kinds of obstacles exist in the path to realizing the potentials which information technology offers to higher education. First, information technology is still in the developing stage, and the performance continues to improve. Though the appearance of the World Wide Web brings it to the practical stage, all of the merits of information technology mentioned above have not yet been realized. "While these new technology-mediated learning environments provide some alternatives to traditional classrooms on campus, most either 'bolt on' to the traditional classroom structure (adding cost) or use technology to replicate and extend it (sacrificing quality)" (Educom's, 1994).

Information infrastructure is the premise in development of information technology in higher

education. The axis of it is the integrated digital networks with optical fibers and communications satellites extending all over the country and world. We cannot separate our plan for usage of information technology from the trends in its development. As for infrastructure, there is both the general-purpose infrastructure and the special infrastructure for higher education, and we have to continue focusing our concerns on both. Since the general-purpose infrastructure is built for various uses such as business, medical care, news, and entertainment, we have to install the usage of higher education into it explicitly. Higher education also needs to lead advanced aspects in the preparation of information infrastructure.

Another problem to be overcome is the rapid obsolescence of equipment, software, and know-how in this field. These constituents of information technology are still inconvenient and challenging to deal with due to deficiencies such as lack of standardization. In addition to physical infrastructure, construction of soft infrastructures such as developing programs, standardization of the teaching materials, and establishment of learning outcome assessment methods become subjects.

In addition, the introduction of information technology presses us to fashion a change of organization structure. An outbreak of resistance is expected because this will necessitate changes in the duties and actions of faculties. In fact, a faculty strike in protest of new instructional technology has already occurred. According to an article in "The Chronicle of Higher Education," the faculty union of Yoke University (Canada) obtained an agreement in writing at the end of a 55-day strike last year that professors would not be forced to use technology in their classrooms or to deliver courses over the Internet. The agreement promised that decisions to use technology would be consistent with the pedagogic and academic judgements and principles of the relevant faculty member regarding the appropriateness of the use of technology in the given circumstances. The union was concerned that professors could lose their autonomy and perhaps even be replaced by their own high-tech creations (Young, 1997b).

And all the problems mentioned above are tied with economic difficulties. Many people point out that rapid adoption of technology will not save money, at least in the foreseeable future. In addition to rapid replacement of equipment, they point to the high cost of maintenance, technical support staff, purchasing and up-grading of software, development of educational software applications, revision of courses to utilize the media, and provision of training needed for faculty to use the technology (Schmidtlein, 1996).

In the Dearing Report, they estimate that the UK higher education sector spends up to 10% of total higher education expenditures on information technology (National Committee, 1997). In

every country, the share of information technology expenditure is growing in total expenditures for higher education. Information technology is expected to contribute to reductions in the cost and improvements in the quality of higher education in the long term. In the short term, however, we need big investments accompanied with high risk.

4. Collaborative Activities and Strategic Approaches

To resolve these challenges, we need wide collaborative activities among institutes of higher education, governments, and business and industry. We also have to develop strategic approaches to cope with these problems.

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